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17 November 1958

MEMORANDUM TO THE FILE

FROM: [REDACTED]

SUBJECT: Trip to [REDACTED]

1. On 6 November, the project engineer traveled to the [REDACTED] in [REDACTED] to observe tests conducted on the newly developed KM-1 high frequency (2-32 megacycles) multicoupler. This multicoupler was developed by [REDACTED] for Rome Air Development Center and [REDACTED] was in attendance during the tests.

2. Tests were made to check gain, intermodulation distortion, isolation between outputs, broadcast band rejection, back to front isolation, and noise figure. Tests results can be found in the included attachments. The [REDACTED] specifications call for a gain of between 1 and 2 db, intermodulation distortion (2nd and 3rd order products) down at least 60 db, isolation between stages at least 40 db, broadcast band down 44 db at 1650 KC, back to front isolation 50 db, and a noise figure of no greater than 6 db. The tests using 250 MW input revealed that the multicoupler was consistently better than these figures except at the very top of the band above 30 mc/s where the figures on one or two of the channels fell a maximum of 3 db below the claimed performance.

3. This KM-1 uses a distributed amplifier for the driving stages and passive hybrid networks in the output stages. The distributed amplifier is in effect a balanced electronic transmission line using twenty E 88CC dual triode tubes. These low noise, 10,000-hour tubes, are presently made in Holland, but will soon be produced in the United States by Amperex, at a cost of approximately \$4.50 to \$5.00 each. One of these tubes is included in the attachments. The hybrid outputs are in effect two resistance bridges and a special hybrid dual output transformer in cascade. Isolation is obtained by conditions in the network which make each multicoupler output the center arm of a balanced bridge when seen looking into any other output. The entire unit operates on 130 watts input power, 50/60 cps, 115/230 volts or 10% to either side of the voltage stated.

4. In the photograph of the front view of the multicoupler contained in the attachments, the eight 70 ohm fixed outputs and one 70 ohm fixed input can be seen. The "test meter switch" and associated meter reads the cathode currents of a series pair in the distributed amplifier, and allows the operator to tie down a malfunction to one of

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two tubes immediately. The B plus position is self-explanatory. On the production models of this unit the connectors will be placed on the back of the unit, but by special request they could be returned to the front as seen here.

5. These units are soon to go into production on an ordered basis only. The delivery date will be about 9 months on orders of fifteen and below, and about 11 months for thirty and over, with some units being delivered prior to this date. The sales department felt, however, that if sufficient interest was shown, the delivery date could be shortened. For fifteen units the unit price will be \$1,579, for thirty units the price will be \$1,386 each, with any quantity between fifteen and thirty having a unit price somewhere between the above stated figures. Spares are quoted at \$271 per unit and include 100% tubes, and one each special component not obtainable on the commercial market.

6. At the present time, NSA is receiving eight of these units at the end of this month, and NRL is receiving six units within the next three months. RADC is about to begin tests on this unit themselves within the next week, and a copy of their findings will be forwarded to the project engineer. There are no units available and will be none for Agency test as all production units are committed upon completion. The RADC engineer commented that he personally felt that this unit, taking the cost into account, was better than the multicoupler, also under investigation by RADC.

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7. It is not possible to make an accurate comparison between the [REDACTED] has not yet delivered its user-test model to RADC for appraisal.

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8. Also during the trip, the project engineer saw the breadboard of a UHF multicoupler and was informed that a VHF multicoupler was also in the breadboard stage. The VHF multicoupler will cover a frequency range from 30 to 225 mc/s and the UHF multicoupler will cover a range from 150 to 450 mc/s. Both these units are still several months from being turned into any type of prototype, but will be watched with interest as they develop.

9. The project engineer also spoke to [REDACTED] of the [REDACTED] concerning the new high power balun being developed. [REDACTED] was of the opinion that within the next two to three months a working piece of equipment would be available for test. The balun will be able to handle 15 KW of A-3 transmission

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with a 3 to 1 VSWR and is expected to be able to handle 50 KW (45 KW by the figures, but expected to handle the overcapacity to 50 KW) with proper tuning. ^{4/15/80} This unit is now in the development stage at the Baltimore plant. The unit will be about three feet long, two feet wide, and two feet high. The overall weight and the matching impedances were not known by [REDACTED].

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10. The engineers at the plant said that there were several other projects in the communications field going on that they would like to show at any time, including some new work in SSB.

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